MINUTES OF CONFERENCE OF WEATHER BUREAU OFFICIALS

and

REPRESENTATIVES OF COOPERATING AGENCIES

on the

ORGANIZATION OF A FIRE-WEATHER WARNING SERVICE

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Called by the Chief of the Weather Bureau

April 14, 1926, 10:00 A.M.

at

Weather Bureau Office, U. S. Custom House

Portland, Oregon

MINUTES OF CONFERENCE
OF WEATHER BUREAU OFFICIALS AND REPRESENTATIVES OF COOPERATING AGENCIES ON THE ORGANIZATION OF A FIRE-WEATHER WARNING SERVICE.

Called by the Chief of the Weather Bureau,
April 14, 1926, 10 a. m.,
at Weather Bureau Office, U.S. Custom House, Portland, Ore.

The following persons were in attendance:

Prof. Charles F. Marvin, Chief of the Weather Bureau, Washington, D. C.; E. B. Calvert, Chief of Forecast Division, Weather Bureau, Washington, D. C.; E. H. Bowie, District Forecasterm Weather Bureau, San Francisco, Calif.; M. B. Summers, Meteorologist in Charge, Weather Bureau Office, Seattle; Edward L. Wells, Weather Bureau, Portland; Dr. Napier Denison, Supt. Dom. Meteorological Service, Victoria, B. C.; R. V. Stuart, British Columbia Forest Service, Victoria, B. C.; E. T. Allen and R. H. Chapler of the Western Forestry and Conservation Assn., Portland; F. A. Elliott, State Forester, and L. F. Cronemiller, Dep. State Forester, Salem, Oregon; C. C. Scott, Sec. Oregon Forest Fire Patrol Assns., Portland, Ore.; P. S. King, Inspector, Salem, Ore.; W. V. Fuller, with Oregon State Dept., Dallas, Ore.; Geo. C. Joy, State Supervisor of Forestry, Plympia, Wash.; O. Bystrom of Washington Forest Fire Assn., Seattle; C. S. Chapman of the Weyerhaeuser Tbr. Co., Tacoma, Wash.; Fred Morrell, District Forester D-1, Missoula, Montana; H. T. Gisborne of Northern Rocky Mt. Forest Experiment Station, Missoula, Montana; C. B. Morse, Forest Service D-4, Ogden, Utah; T. C. Spaulding, Dean of School of Forestry of Montana, representing private timber owners of Montana, Missoula; Ben E. Bush, State Forester of Idaho, Moscow; H. C. Shellworth, Secy. Southern Idaho Timber Protective Assn.; G. B. Mains, Forest Supervisor, Boise, Idaho; R. L. Deering, Asst. District Forester D-5, San Francisco; C. M. Granger, District Forester D-6, Portland, Ore.; A. O. Waha and W. B. Osborne, Jr., Forest Service, Portland; Thornton T. Munger, Director, and R. E. McArdle and A. G. Simson, Pacific N.W. Forest Exp. Sta., Portland, Ore.; V. A. Brewer, District Warden, Yacolt, Wash.

The meeting was opened at 10 a.m. by Major E. H. Bowie, District Forecaster of the Weather Bureau at San Francisco, Cal., who introduced Prof. Charles F. Marvin, Chief of the Weather Bureau, Washington, D. C. Prof Marvin announced briefly the purpose of the conference and expressed his gratification that so many forestry interests were represented. He then called on Mr. E. T. Allen to open the discussion of the conference with any remarks that he considered pertinent.

Mr. Allen stated that inasmuch as Congress has made an appropriation approximating $20,000 for the carrying on of fire-weather work of the Weather Bureau in the United States until June 30, 1927, it would seem that this conference should consider and discuss with Weather Bureau officials how much of the appropriation should be expended in the Western States; how it is to be divided for the purposes of forecasting, research, instrumental equipment, traveling expenses, etc., and to what extent the cooperative protective agencies should contribute to the carrying on of the work. He stated that in his opinion meteorologists engaged in this work should acquire some knowledge of forestry, and that foresters should know more about meteorology.

Prof. Marvin in reply assured the conference that the Bureau would assign as many men to this work as the limited appropriations would allow; that the Budget officials had been assured that not over $5,000 would be spent in the East and approximately $15,000 in the West, including $3,456 in the State of Washington. He stated that it is the intention to assign at least some men to this work the year round, their time during the non-fire season to be spent in research work and study of the records obtained during the fire season. He emphasized the fact that cooperation on the part of interested private agencies and associations has come to be generally recognized as desirable and necessary, and cited the fruit-frost work of the Bureau as an example. He asked for an expression of those present as to the attitude of forestry interests on cooperation with the Weather Bureau in this work.

At this juncture Major Bowie stated that the matter of cooperation would come up for discussion later in accordance with the tentative program that had been prepared, and suggested that the objectives of the Fire Weather Warning Service be first taken up. Dr. Denison was then called on for remarks. Dr. Denison said it was a great pleasure for him to be present. He felt that cooperation is one of the most important questions and he could state that so far as they in British Columbia are concerned they would be only too glad to do all they could to assist in the fire-weather warning service for the whole Pacific Coast. He explained the nature of their Service and particularly one feature of it which has been handled with practically no expense to them except a slight increase in cost of telegraphic reports, viz., the taking of special humidity observations by observers throughout British Columbia. This year observations will be taken at 9 a.m. and at 2 and 5 p.m. These will be compiled in the office in Victoria and special warnings will be made and sent out. They are now able to reach the more remote logging communities who greatly appreciate the receipt of the reports. The public are becoming educated to this subject to such an extent they are beginning to understand what the question of humidity means. There has been a marked improvement in the attitude of the public in regard to camp fires, as a result of the warnings sent out and posted. He feels that while British Columbia faces a serious condition this year the situation will not result so disastrously because of the improved method of fire-warning service.

Prof. Marvin expressed his gratification that the Canadian Meteorological Service was represented at the conference, and spoke of the cordial cooperation that has existed between the Canadian and United States weather services. Meteorology, he said, knows no national boundaries.

Mr. Stuart was then called on and responded that Dr. Denison had outlined very well what they have done in British Columbia in connection with fire-weather warnings, and that Dr. Denison's branch had done about 95% of the work. But he wished to assure the Weather Bureau officials that the British Columbia Forest Service will be glad to cooperate in any way it can, and hope to benefit by whatever interesting and useful results are obtained from the enlarged program of the Weather Bureau in the States.

Major Bowie suggested that the forestry interests represented at the conference state what use they are making of the fire-weather work of the Weather Bureau, particularly the forecasts, and called first on Mr. Geo. C. Joy.

Mr. Joy said they are making the following use of weather forecasts furnished them. Mr. Summers notifies them from his office what the weather is going to be, and in turn that information is sent out by telephone to some of the supervising wardens in the field, who in turn pass it on to the local forest protective agencies, and by them to the logging operators. The information is also furnished direct to some of their other wardens by telephone or telegraph, and when necessary, extra precautions are advised to see that no fires are started at that time. He sees a big field yet for the Weather Bureau predicting rains and periods of low humidity.

He said he had accompanied Prof. Marvin to a large logging operation the day before, where the latter saw an area of slashing. One of the big problems in this region is the disposal of slashings and it is in connection with this that predictions of rain are needed. If they had the warnings they could pass them on to the operators who could wait for favorable weather conditions to burn their slash. Fall burning has advantages over the spring or early summer burn, for by setting his fire in the fall the operator has some assurance that seasonal rains will end the danger before the burn can get beyond his control, though if he postpones it too long it will be too wet to burn at all that year. The great point is to burn just before a rain and there will be little trouble with fire afterwards. Another way in which Mr. Joy feels these forecasts are helping is in arousing public sentiment--creating a fire conscience. Permits are required to burn piles of rubbish around camps, in clearing rights-of-way, etc. What the protective agencies want to create is a feeling that when these warnings of low humidity are sent there should be no fire at all.

Mr. Allen called attention to the large outlay made each season by the forestry interests of the Pacific States in combating and preventing fires, and pointed out how the fire-weather forecasts, as well as advices of ameliorating conditions can and do materially reduce the expenditure of funds and man power.

Mr. Elliott stated they follow in Oregon about the same plan as outlined by Mr. Joy. They get the information from the Weather Bureau, telegrams are sent directly to the field men, and they in turn inform the operators. In a number of cases last year large operators who had agreed to close down when weather conditions were bad did so, and more operators are agreeing to do so this year. The forecasts indicate the approach of fire weather and when a certain point is reached these operators close down until conditions are better.

Mr. Bush upon being called upon said they in Idaho are very much interested in weather and have a rather complicated condition there. Northern Idaho is entirely different from southern Idaho, for while last year southern Idaho had one of the best fire seasons in years, northern Idaho had many lightning storms. On the Coast when the relative humidity gets to 30% they are very much concerned. In Idaho for weeks at a time it remains around 15%. They have many conditions to contend with besides relative humidity, such as peculiar air currents, etc. What they would like there is more localized forecasts and for longer periods in advance, and he wondered if it would not be possible for weather observers to make forecasts for different parts of the state. He explained the effect such forecats would have in connection with handling forest fires--how it would perhaps reduce the number of men to be sent out, disposition of supplies, etc., in this way effecting an enormous saving in labor bills and supplies. He said there is a great possibility for help along these lines in Idaho.

Major Bowie said that the Weather Bureau appreciates the fact that other factors than low relative humidity have much to do with the fire hazard in Western Montana, Idaho, and California, and assured Mr. Bush that a meteorologist will be assigned to the work of studying the conditions in Idaho and Western Montana and to the making of special fire-weather forecasts for those districts; this, he said, should be helpful to the forestry interests in those regions.

Mr. W. B. Osborne, Jr., in charge of fire prevention in the National Forests of Washington and Oregon, was then called upon for remarks.

Mr. Osborne said he thought the various speakers had covered the ground very well as to the use made of weather predictions by the local protective agencies. He wished, however, to emphasize one point made by Mr. Joy, the psychology of the thing itself. He believes that our clearer understanding of the reaction of vital weather factors on the occurrence and spread of fires has been a tremendous factor in preventing fires. "It was not many years ago when we had trouble all of the time with smolderung fires around operations, rights-of-way, clearings, etc.", Mr. Osborne said. "When the operator was requested to completely extinguish a fire he would say that the fire had been smoldering for a week or more and had not spread more than a few feet, that materials were too wet to burn; 'he saw no cause for worry; he would watch it and put it out if it started to spread'. He did not appreciate that one day of low humidity might send that fire all over the country. Now operators appreciate the significance of low humidity and the extremely rapid changes that occur in the inflammability of forest materials.

Acknowledging this they are forced to just one logical conclusion, the "smoldering fire" must be promptly and completely extinguished. There must be no dormant fire there to pick up and spread on the bad fire day thatdevelops and arrives so suddenly that it usually is not sensed until the fire is way beyond control.

"In the Forest Service the weather reports are usually sent direct to the central dispatcher--one on each Forest. The dispatcher is in telephonic connection with the entire protective force on the Forest and passes the reports on. These predictions are very useful in handling the protective force from day to day, and plans are often changed according to reports received, that is, whether a man shall remain at the telephone all day or go out on some other work. Frequently intensity of patrols are varied, roads and operations closed, and burning permits issued, refused or cancelled according to these forecasts. They influence the number of men to be sent to a fire, plans and methods of attack, and in fact every phase of protective work.

"In this connection I have sometimes had the feeling that our cherished desire for seasonal and long-time predictions has hindered us in grasping the enormous field open for the practical utilization of short-time predictions down to the matter of only a few hours advance notice of changes in weather. In fact short-time predictions will always be more specific and accurate and therefore tend to immediate and effective action.

"Another phase touched upon by Mr. Joy and which seems to me to be a big field is in connection with slash disposal. Heretofore we have been considering predictions in connection with preventing fires--in other words the prediction of extremely dangerous periods. The time is rapidly coming, however, when predictions or advices will be issued as to the ideal time for slash burning. The disposal of slash is a problem in itself and forest protective agencies should not be satisfied with simply receiving warnings of dangerous weather, but advices should be sent out as to the ideal day or moment to burn slash."

Mr. Osborne was followed by Mr. Morrell who said that Mr. Gisborne has been on fire research work in District 1 for three years and has worked on this particular study, and he could tell them more about the situation than he himself. They are interested in conditions in northern Idaho as well as those in Montana, for Idaho has more trouble than Montana. In District 1 they have been distributing forecasts to supervisors as they come from the forecasters, though they are not circularized as much as he would like to have them or as much as they should be to give them accurate information that would be of real value to them. He thinks they have probably not had enough observation points from which to furnish forecasting information. Most of the weather stations he understands are valley stations and there are comparatively few mountain stations up in the forests which are sending in reports from which to make forecasts. It seems to those in the Forest Service that perhaps the first need is to add the necessary instruments at the stations already established and establish some new stations. The National Forests can furnish observers,

or usually can. There might be some difficulty in getting wires out since the local telegraph stations in small towns do not open early. It has seemed to Mr. Morrell that if they could get some mountain stations established to furnish the forecaster with information on which to base more local forecasts it would help them on their problem. He understands from Mr. Gisborne that there is a great deal of data that have been gathered from these stations that are available to and would be of benefit to the Weather Bureau.

Prof. Marvin stated that the localized forecasts mentioned by Mr. Morrell will come about with time, and Major Bowie said the Bureau realizes that different problems of humidity and wind are peculiar to each locality. Study of these is a part of the Bureau's fire-weather program.

Mr. Shellworth then spoke, stating that the condition in southern Idaho during the fire season is one of extremely low humidity, the relative humidity being less than 15% for weeks at a time. Two years ago they had a week where it was less than 7%. Besides this they have the lightning storms and dry winds off the desert. If they could have predictions in regard to these conditions it would be of great help to them.

Mr. Mains stated that their fire weather problems are chiefly those incident to lightning and tourists; that 75% of their fires are caused by lightning. He spoke highly of Mr. C. E. Norquest, meteorologist in charge of the Boise Weather Bureau office, and of his untiring efforts to assist the forestry interests in the face of inadequate assistance.

Mr. Deering said in California the relative humidity often reaches a low point and remains there for a long period during the summer. In addition to the low humidity factor they have dry winds and electric storms which cause a great deal of their fire troubles and of which they would like to have warnings. The Weather Bureau has rendered excellent service in the past, insofar as the limited amount of money available for the work permitted. But on account of lack of men and funds it has been impossible for as detailed a study to be made of the particular problem as he knew the Weather Bureau would like to make. The whole proposition has had to be handled as a sort of side line by both the Forest Service and the Weather Bureau. He knew that with special men assigned to the work progress would be made much more rapidly. California as a state is tremendously pleased that an enlarged program is to be undertaken and is ready to help to its utmost. He assured the Weather Bureau that the Forest Service, the State Forester and the local lumber companies will go the limit in establishing local stations and supplying information of value in making forecasts. While they are not particularly well fixed financially, there is unlimited man power available and they will do everything possible in making observations.

Major Bowie stated that research work pertaining to fire-weather problems in California would be carried on during the winter by the mereorologist to be assigned to the San Francisco office.

The organization of the fire-weather service was next taken up for consideration. Mr. M. B. Summers was asked to explain the workings of the service in Washington. He stated that the main forecasts are sent out in the evening, based on the 5 p. m. meteorological reports from Weather Bureau stations and those in the adjacent Canadian Provinces. Occasionally, when conditions warrant a change in advices, forecasts are sent out in the morning, based on the 5 a.m. reports. Distribution is effected by means of the telegraph, telephone and radio, as well as by the Seattle press and the daily weather map, issued by the Weather Bureau. Telegraphic and telephone advices are sent to a few or all of about 35 addresses in the State, as occasion demands. These consist of the State Supervisor of Forestry (in each instance), the various supervisors of the National Forests, the Washington Forest Fire Association, and the various wardens of private fire prevention agencies. Radio advices are disseminated by the three broadcasting stations in Seattle, each twice daily. The radio is found to be a most effective means of spreading information of fire-weather conditions.

Major Bowie confirmed Mr. Summers' statement that radio is very effective in bringing about a wide distribution of forecasts in warnings and has come to be indispensable in this work.

Mr. Edward L. Wells of the Portland office of the Weather Bureau called attention to the fact that formerly radio stations did not broadcast weather information on Saturday nights or Sundays, but that now KGW station at Portland performs this service regularly on those days.

Prof. Spaulding discussed radio distribution of weather information in Idaho and Montana and stressed the desirability of making extended use of it.

Mr. E. B. Calvert wished to know to what extent lumber camps and operations are equipped with radio reception apparatus, to which Prof Spaulding replied that their use is fairly general and will become more so as the utility of the forecasts becomes more apparent.

In an informal discussion as to the utilization of special and cooperative observers in fire-weather work, Prof. Marvin expressed the belief that there will be the same readiness on the part of protective agencies to cooperate in the future as in the past.

Mr. Bush asked several questions as to the meteorological principles underlying weather and its movements. These were answered by Major Bowie, who made a general statement on the primary causes of weather conditions and movements in the Pacific States.

Mr. Morrell stated that data from forest ranger stations in his district can be furnished if instruments are provided.

Mr. Granger inquired whether year-long observations are desired; or whether they are needed only for the fire-weather season. Prof. Marvin replied that this would depend on conditions. Mr. Granger then said that Forest Service employees are available in some localities the year round, but in others only during the fire-weather season.

Prof. Marvin again expressed the belief that cooperation on the part of the Forest Service and protective agencies will be forthcoming to as great an extent as necessary.

At this juncture Prof. Marvin announced that Mr. Geo. E. Griffith of the office of Public Relations of the Forest Service was present with a reel of films, used by the Forest Service in its educational work in the prevention of forest fires, and that these would be shown before the conference adjourned for luncheon. The pictures were most interesting and were much enjoyed by all those present.

The afternoon session of the conference convened at 1.53 p.m. Prof. Marvin announced that the subject of Instrumental Equipment would next be taken up for consideration. He stated that the Weather Bureau would be able to supply some of the equipment, but not all of it, and that it is hoped that the forestry interests can see their way clear to bear a part of this burden of fire-weather work. Messrs. Granger and Morrell representing the Forest Service signified their willingness to cooperate in this manner, but without committing themselves as to the extent of the outlay. Mr. Granger said he probably could provide observers for all necessary stations during the field season, but less men would be available during the winter season. He did not know offhand just what equipment was available in District 6 though he understood quite a number of sling psychrometers and a few anemometers had already been purchased. He thought he would be prepared to buy a reasonable number in addition, especially some of the simpler forms of instruments. District 6 would expect to do its share in this respect but he did not know just how far he could go, since there was not a generous supply of funds on hand and he would be limited by the resources available.

Messrs. Allen and Bush, representing the private forestry interests, stated that cooperation from that source may be expected in about the same degree as before.

Mr. Bowie requested that the conference hear from Mr. C. S. Chapman on the matter of cooperation in supplying instruments, and Mr. Chapman in turn asked for an expression from Mr. O. Bystrom. Mr. Bystrom stated that the Association which he represents will cooperate in this manner in any way that may be necessary.

Prof. Spaulding stated that the State University at Missoula will cooperate by turning over to the Bureau's use a meteorological station equipped with a full complement of instruments.

Prof. Marvin expressed his pleasure at the evidence of all necessary cooperation on the part of forestry interests in the matter of supplying instrumental equipment.

The matter of cooperation in investigation and research was then taken up, and the chairman first called on Mr. Thornton T. Munger. Mr. Munger outlined lines of investigation that in his opinion properly should be carried on by the Weather Bureau and those that should be prosecuted by the Forest Service.

Mr. Munger said that he felt he was speaking for foresters in general in welcoming the increased activity of the Weather Bureau in this field. In predicting fire weather the Weather Bureau has been looked upon by forest protectionists as a sort of savior. Prediction is an important phase of fire control.

The Forest Experiment Stations have considered the study of fires an important part of their job, and by such study hope to help the administrative agencies in knowing more about the causes and behavior of fires and better methods of suppression. All the Forest Experiment Stations are now working on fire studies. Pending the time when the Weather Bureau would go into the field of fire-weather research on a substantial basis, the Experiment Stations have been drawn into the field somewhat. They have done a certain amount of study of the connection between weather and the causes of fire. The meteorological phase of fire studies the Forest Service is most happy to have the Weather Bureau now in a position to undertake.

The whole study of fires and weather is bound to be a cooperative one. It can not be handled altogether by one branch or the other. For example, certain classes of data might be used by both agencies. From data on fires the forester may want to extract one type of information, the meteorologist another class. Mr. Munger stated he had jotted down some of the studies he thought the forest protective agencies need to have made and grouped them rather tentatively in two classes, elaborating them somewhat in the form of memorandum. One class would seem to fall within the province of the Weather Bureau and the other class within the province of the Forest Experiment Stations. Mr. Munger said there is a perfectly enormous field for research ahead, both in meteorological study for better prediction and from the forester's point of view in applying the information obtained. Mr. Munger's memorandum, of which copies were passed around, but of which he gave in his talk only an epitome, is in full as follows:

April 13, 1926

MEMORANDUM

re FIRE WEATHER STUDIES

It seems desirable to consider the most logical allocation of fire research projects between the Weather Bureau and the Forest Service.

The current and prospective activities in fire studies, which have some connection with meteorology and in which the Forest Service has now some interest, are defined in two groups.

FIRST consider those which seem to be fundamentally the function of the Weather Bureau:

(1) Assembling of daily or periodic weather and climatological records from various sources. At the present time sets of records of one or more weather factors are kept by various agencies other than the Weather Bureau. These should all be rounded up and filed and compiled by the Weather Bureau.

(2) Expansion of observing stations, to more thoroughly cover the forested districts. Additional stations should be put in under the supervision of the Weather Bureau both for forecasting purposes and for climatological purposes. The Forest Service should cooperate freely in having its men make observations as requested by the Weather Bureau. Some of these stations may be for the summer fire season only and some yearlong.

(3) Short-time prediction of fire weather. This is what the Weather Bureau alone has been doing and it is the most urgent line of fire weather activity. The predictions should be localized as far as possible that the natural variations in weather from one district to another may be taken account of. I venture to say that there is opportunity to do an immense amount of research to place local forecasts in these mountain wildernesses on a more accurate basis, and that such research would in a very short time yield ample dividends.

(4) Experimentation and standardizing of fire weather observers' instruments. It is not definitely settled what form of humidity instrument best fits the needs of the warden or ranger who is taking humidity readings for his own information or for reporting in to the Weather Bureau. Study of types of equipment and perhaps inventions of shelters or equipment is needed. The Experiment Station has done a little work with various types of humidity recorders and this project might well be taken over by the Weather Bureau.

(5) Further study of behavior of lightning storms, their relation to local weather and their prediction. The lightning storm reports now being collected annually offer a splendid mass of data to help in the study of the meteorology of the local storms. It is a job for a trained weather man to get from these reports what will help in an understanding of the laws of occurrence and behavior of these storms and their predictions.

(6) Statistical study of probabilities or frequency of certain fire weather factors. Last year the Experiment Station analyzed the rainfall records of the Weather Bureau for 100 stations, and some interesting conclusions were reached. There is room for much further statistical study by the Weather Bureau of the other factors that go to make up fire weather--such as the frequency of low humidities, lightning storm probability, distribution of high night humidities, fogs. Thus the factors that go to make up the weather hazard may be pieced together and appraised for each locality throughout the season.

(7) The study of radio static as an indicator of the approach of fire weather. This study the Forest Experiment Station has had underway for three years and plans to continue this season. It is really within the province of the Weather Bureau and should be taken over by it whenever it is ready to do so.

(8) Inspection by the Weather Bureau officials of the equipment and instruction of the observers at all stations maintained by fire weather cooperators, whether Forest Service, State or private.

(9) Long-time predictions of the character of the season based on probabilities, cycles, or any other methods that are worth investigating.

SECOND: There is a large field for research concerning the effects of weather upon the inflammability of the forest and the behavior of fire, i.e., the applying of the Weather Bureau studies to the job of forest protection. This seems properly to be a phase of forest research which naturally falls within the province of the Forest Service. Some of these studies might be defined for the sake of illustration as follows:

(1) Inflammability point of various forest fuels in terms of their moisture content.

(2) Dampening effect of rains of various intensities under various types of cover.

(3) Rate of drying out to the inflammability point of vegetation under certain sets of climatic conditions.

(4) Behavior of fire under known conditions of humidity, winds and temperature (considering of course also topography and amount of inflammable material).

(5) Seasonal march of inflammability as indicated by the condition of the growing vegetation.

(6) A schedule for rating fire hazard, based upon the summation of all the weather elements and the combustibility factors.

(7) Knowledge of the precise atmospheric conditions under which brush burning or back-firing may be done safely in slash-disposal or fire-fighting operations.

The above touches upon only those fire studies which relate to weather; there are numerous other problems connected with fire control but not as affected by weather which the forester must also study, that need not be considered by this conference.

(Signed) T. T. Munger,
Director.

Mr. Allen suggested that the investigations include forest insurance problems and the so-called conflagration hazard.

Prof. Marvin expressed his appreciation of the detailed program of investigation suggested by Mr. Munger.

Mr. H. T. Gisborne was then asked to speak. Mr. Gisborne stated that fire weather studies were started in northern Idaho and western Montana four years ago. Weather stations were installed in typical forest areas as indicated by the different forest types. They have very good records from four stations, records from two of them extending back to 11 and 13 years. These are available for the use of the Weather Bureau. These stations are fairly well equipped with instruments, some of which have been purchased from Forest Service funds and some loaned by the Weather Bureau. The stations are being extended this year into the Flathead and Bitterroot regions. At the Priest River Experiment Station the work has been confined to the lines indicated by Mr. Munger and from Mr. Gisborne's experience he heartily agrees with Mr. Munger as to the division of future work between the Forest Service and the Weather Bureau. If they can have the desired, detailed accurate weather forecasts for forested regions from the Weather Bureau they should be able to apply suppression methods according to the predictions. Experimental work at that Station has reached the stage where they can classify temperature, humidity and evaporation rate as to whether it is generally safe, slightly dangerous, dangerous, or extremely dangerous. If they can get predictions on temperature and humidity in the four classes as they have defined the effects they would know how to use them, and this is the sort of prediction they are in need of. The effects of wind and rain also can be defined in greater accuracy than these weather elements can be predicted. Mr. Gisborne is greatly pleased because the Weather Bureau is getting into this work, for he is certain it will lead to more accurate forecasts for the forested areas and they are ready to use these predictions as fast as they can get them. They have received daily forecasts for two years and last year on some big fires made excellent use of them. He favors the 5 a.m. forecasts for they reach the Forest Supervisors about 9 or 10 in the morning. He also favors telegraphic reports because as yet the radio has not proved consistently dependable, though practically every Forest has radio equipment at one place or another, some of which is used to good advantage.

Prof. Marvin stated that the researches of the Forest Service along the line of fire-weather studies should be published, and expressed the hope that the Weather Bureau will be able to do so.

At this juncture Prof. Spaulding reiterated his offer of the loan of the instrumental equipment at Missoula for research purposes at any time desired.

Mr. A. G. Simson was asked to tell the conference about experiments he has made at Wind River Station with static as affecting relative humidity. He said the static study was begun by Dr. Hoffman several years ago and then taken over by Mr. Simson, the idea being to see if static could be made to furnish some index of relative humidity, and if so, to ascertain

the possibility of static as a means of forecasting relative humidity. There is a radio receiver and recording instrument at Wind River and the work so far has indicated that there is a relation between static and relative humidity. So far the study indicates that the morning static minimum may be taken as a fairly dependable index of subsequent relative humidity, but it has not been carried farther than that. Unfortunately a 6 or 8/hour index is about all that has been secured and it is rather short for practical use. The work will be continued until some conclusive results are obtained or another agency takes it over.

The matter of telegraphic observational data for forecasts and warnings was next taken up.

Major Bowie gave an outline of the methods and facilities of forecasting, as based on the synoptic chart, and called attention of the use of twice daily reports of relative humidity as telegraphed from Weather Bureau stations throughout the Pacific Coast. Radio reports from vessels in the Pacific Ocean will be made available, he said, to the Los Angeles, Portland, and Seattle Weather Bureau offices, beginning April 15, 1926, in addition to the district forecast center at San Francisco, where they have been available for some time past, and where a Pacific weather map has been published for about a year. This type of map is to be published in future at the other three offices named, and will be an aid in fire weather forecasting. Effort will be made to synchro ize the observational hours in Alaska with those in the States. A more extended knowledge of conditions on mountain peaks is desirable, and in all probability several stations of this character will be established. It is believed that observations of the upper air by means of pilot balloons at at least one statioj in addition to that at Camp Lewis, Wash., and Victoria, B. C., would be valuable, and in all probability the Bureau will be able to install such a station at Spokane. Major Bowie called attention to the cooperation of the Dominion Meteorological Service at Victoria in making available to the Bureau the balloon observations at that station.

Dr. Denison offered to supply humidity data from Canadian stations, if desired, in addition to the other meteorological data now furnished.

Major Bowie stated that in future the degree of fire hazard in Washington and Oregon will be telegraphed to the district forecast center at San Francisco at each regular observation. Mr. Gisborne called attention to the fact that the Spokane office of the Weather Bureau can obtain information by telephone from the Forest Experiment Station as to the degree of hazard in northern Idaho.

The cost of the fire-weather warning service was next taken up, and the Chairman called on Mr. Calvert to acquaint the conference with the status, scopr and limitations of the appropriations made by Congress for this purpose. He sketched the requirements of the Director of the Budget in the making of estimates of expenditures and in the actual outlay of funds, and called attention to the fact that under the existing agreement with the Budget officials, about $5,000 of the fire-weather appropriation must be

spent in eastern forestry districts, leaving about $15,000 for the use of Montana, Idaho, Utah, Washington, Oregon and California. He called attention to the fact that the Bureau actually will expend considerably more than $15,000 in these western States, owing to the fact that certain telegraphic expenses are paid out of the general fund and not from the fire-weather fund. Prof. Marvin also stressed the fact that the Bureau is making this additional outlay.

Mr. Bush wished to know whether the forecasting work of the Spokane and Boise stations can be extended to include Idaho, to which Major Bowie replied that this work will be taken care of by the mereorologist that is to be assigned to the Spokane station.

Mr. Allen then wished to know whether this work will still be centralized at San Francisco, and Major Bowie replied that the jurisdiction of the San Francisco office was only of a supervisory character; that while state forecasts of fire weather conditions are issued from that office, the officials at Portland, Seattle, and Spokane have blanket authority to use them, in whole or in part, as they may see fit, or to discard them altogether, as their judgment and knowledge of local conditions may dictate.

Mr. Bush raised the question of Montana being in the Denver forecast district instead of the San Francisco district. Prof. Martin stated that this is a matter that will have to be worked out by the Bureau, and that whatever decision may be arrived at the forestry interests of Montana will receive the service to which they are entitled.

Mr. Allen expressed his gratification that the West is to receive about $16,000 of the appropriation and suggested that eastern forestry interests must get out and present their needs, as have the western interests.

Mr. Calvert called attention to the fact that before Washington and Oregon began the fire weather work, a limited service of this character was in operation in eastern forest regions.

Prof. Marvin reminded Mr. Deering, in answer to an inquiry, that an assistant, a trained meteorologist, will be assigned to San Francisco to correlate data and inspect stations and install equipment.

Major Bowie stated that the Weather Bureau will bear the expense of transmitting telegraphic reports of observations to the district centers and of warnings and advices to designated forestry interests, these in turn to effect, without cost to the Bureau, such detailed distribution as will bring them within rezch of the timber operators and loggers.

Messrs. Morse and Shellworth inquired as to the service that will be given to southern Idaho and northern Idaho, stressing the need of localized forecasts in those districts and in a visitation of camps to instruct observers and install equipment.

The matter of transportation and subsistence of Weather Bureau men engaged in field work of the fire weather service was next taken up. It was the concensus of opinion of the forestry interests represented that they will take care of this part of the expense of the fire weather program. Mr. Joy stated that the Washington Forest Fire Association bore the traveling and subsistence expense of Mr. Alexander, Meteorologist in charge of fire weather work in Washington last year, and that the total outlay was only $300, not including the wear and tear on the automobile used for that purpose.

At this juncture Major Bowie suggested that the forestry interests appoint a meteorological committee to confer with the Weather Bureau on matters pertaining to the Fire Weather Service, the function of the committee to be the offering of suggestions and criticisms looking to an improvement of the service and making it of the greatest possible benefit in its field of action, and to act as a liaison between the various forestry interests and the men engaged in fire weather work. After much discussion as to the need, scope, size and authority of such a committee, it was moved by Mr. Granger and seconded by Mr. Munger that any questions or matters upon which the Weather Bureau desires an opinion or decision by forestry interests be referred or submitted to the Standardization Committee of the Western Forestry and Conservation Association. The motion was unanimously adopted.

Prof. Marvin then announced that the objects of the conference had now been achieved, and thanked those in attendance for the constructive suggestions and the fine spirit of helpfulness manifested during the meeting, and that brought about its successful conclusion. He expressed the hope that the Weather Bureau may justify the confidence reposed in it by the forestry interests as indicated by their cordial and liberal cooperation.

Adjournment was made at 4:00 p.m.

(Signed)

M. B. Summers,
Secretary.

UNITED STATES DEPARTMENT OF AGRICULTURE
Weather Bureau
Washington

Office of the Chief

October 1, 1935.

CIRCULAR

INDICATING TIME OF PILOT BALLOON OBSERVATIONS
IN DAILY TRANSMISSION OF REPORTS

Effective October 15, 1935, the time of pilot balloon observations will be indicated in the daily reports transmitted by radio and teletype as follows:

Add 20 minutes to the time of releasing the balloon. Change this to nearest whole hour. Convert to Eastern Standard Time. Use 0-23 hour basis. For example: Denver, Colo., balloon released, 3:12 p. m., Mountain Standard Time. Adding 20 minutes gives 3:32 p. m. Changing to Eastern Standard Time gives 5:32 p. m. Changing to the nearest whole hour on the 0-23 hour basis gives 18. Thus, this will be indicated in the message as follows: DV 18UA instead of as DV 1512MS UA as at present.

The procedure described above will also be followed in the telegraphic word code, that is, the nearest whole hour as obtained above will be coded in Eastern Standard Time.

The purpose of adding 20 minutes to the time of the balloon's release is to indicate more nearly the mean time of the observation. The omission of the minutes and the letters ES, CS, etc, will result in an appreciable saving of time on the teletype circuits.

Weather Bureau observers in filing these reports with local Department of Commerce operators for transmission will furnish these operators the time of the balloon's release, plus 20 minutes, so that the local broadcast will indicate the mean time in minutes in local standard time.

No change in the present method of entering times of balloon runs on Forms 1110A and 1115 will be made.

Weather Bureau circular, dated July 1, 1933, Instructions for Reporting Pilot Balloon Observations, is hereby amended accordingly.

C. C. Clark,
Acting Chief of Bureau.